EMTAC mini-S3 Bluetooth GPS GPS Receiver

User Guide

The mini-S3 pairing code is 0183.

Notice

We suggest that you carefully review the User Guide prior to using your GPS receiver. The mini-S3 BTGPS receiver is a highly sensitive piece of electrical equipment that can be easily damaged through misuse. In order to help you fulfill any warranty obligations, read the User Guide in its entirety. The mini-S3 passkey is 0183.

Congratulations on your purchase of the mini-S3 BTGPS!

The mini-S3 is an excellent navigation and positioning aid when used with a Bluetooth enabled host device and GPS application software. Your package should contain the mini-S3 BTGPS Receiver, car charger, AC (wall) charger, lanyard, and a product CD containing this manual and the Crux-View test software.

Utilizing the User Guide

This User Guide is an important part of the mini-S3 BTGPS. Reading the User Guide will help you get the best performance from your receiver. In addition to helpful operating information, the User Guide brings attention to potential safety concerns and warranty obligations regarding the receiver. The mini-S3 BTGPS Receiver is a highly sensitive piece of electrical equipment that can be easily damaged through misuse. The warranty will not cover failure if the product is abused, misused or used for other than the intended purpose. Read all the information carefully to avoid damage to the GPS receiver. The mini-S3 pairing code is 0183.

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The mini-S3 pairing code is 0183.

What You Need to Get Started

1. A Host Device

A Bluetooth enabled host device (i.e. PDA, smartphone, laptop, etc.) is needed to receive GPS input data. Each host device receives GPS input differently. Consult the instructions of your particular host device on how to enable your device to receive GPS input.

2. GPS or Mapping Software

Before you begin using your mini-S3 BTGPS Receiver you must complete the application software installation tasks on your host device. Different software programs configure the GPS input differently. Consult your software's user manual to configure the software to accept GPS input.

If you do not have mapping software, in this User Guide CD-ROM, there is the "Crux-View Test Program" (trial version) for testing purpose. Please follow the step-by-step operation guide indicated and described in the Crux-View (Trial) Manual file (in .pdf format). This will give you the basic GPS information needed to proceed.

Note: The Crux-View Test Program is helpful to have installed if you need additional technical support.

Note:

(a) The Crux-View Test Program is a trial version program and is available only for testing purposes.

(b) The Crux-View program is only to be used with EMTAC BTGPS units.

(c) The Current version of Crux-View supports ARM (StrongARM/X Scale) based PPC.

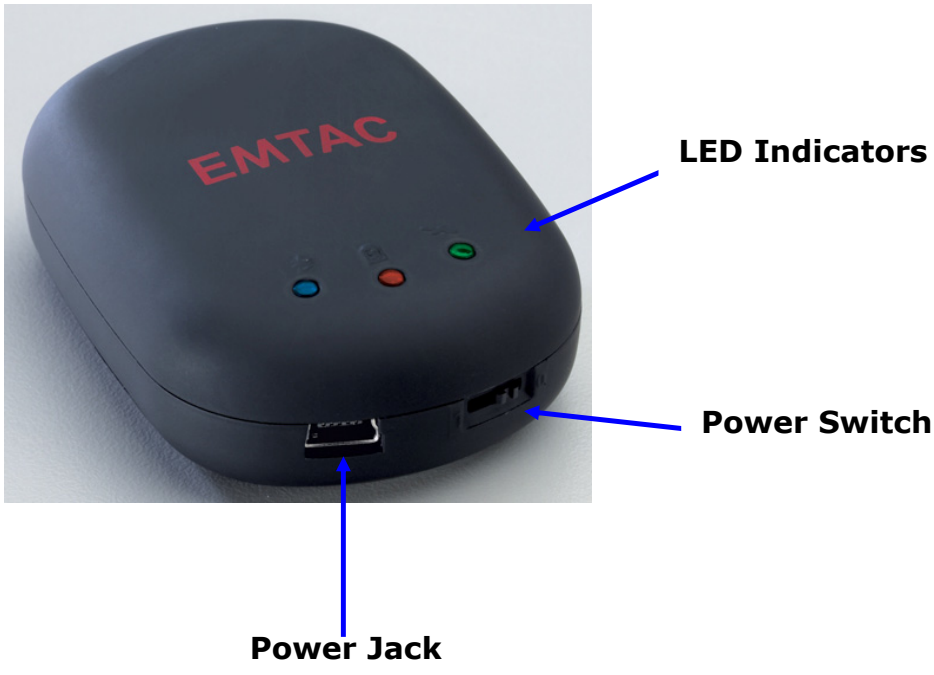
3. The mini-S3 BTGPS Receiver

The mini needs to be fully charged prior to using it for the first time.

CAUTION: Use only an EMTAC branded charger with the mini to charge the receiver. Use of other chargers can result in failure of the unit and/or its Lithium-ion battery.

Parts of the mini-S3 BTGPS Receiver & What They Do

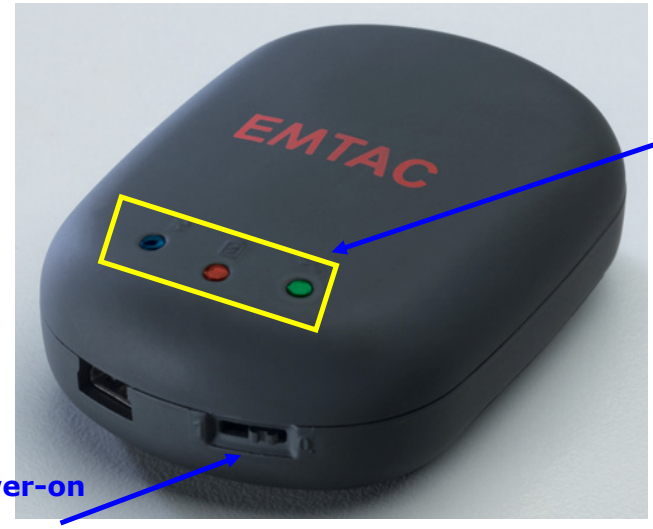
mini-S3 BTGPS at a Glance



Power Switch

Slide the switch sideways to turn power on and off.

I represents power ON O represents power OFF



Status LED Indicators:

Blue **Orange**/**Red** **Green**

Switch to power-on position:

" I "

LED Indicators

The three LED lights indicate the operational status of Bluetooth, GPS, and battery.

Symbol: **Blue** LED Light indicates Bluetooth pair/connect status

Flashing every 1 second: mini-S3 powered-on and waiting to pair/connect.
Flashing every 2 seconds: mini-S3 is connected and paired with the host.

Symbol: **Green** LED Light indicates GPS status

Constant on: mini-S3 is powered on, attempting a location fix.
Flashing: mni-S3 has a location fix.

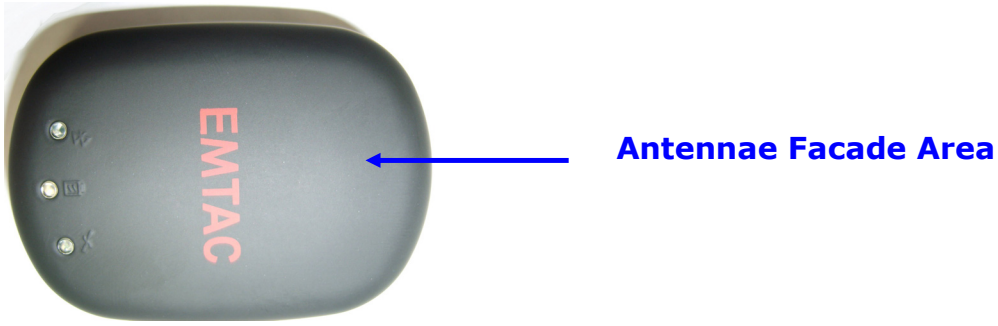
Symbol: **Orange** /**Red** LED Light indicates Battery status

Red light constant on: Battery low.
Orange light constant on: Battery under charging.
No light (light off): Battery fully charged

Antenna Façade

Your mini-S3 is integrated with a highly sensitive internal 1.5GHz GPS antenna and a 2.4GHz Bluetooth radio. These internal components provide satellite signal reception for position fix as and data communication between the mini-S3 and your Bluetooth enabled host device.

The antenna facade is the top surface of the mini-S3. Keep this surface clean and with an unobstructed view to the sky while operating the mini-S3. **CAUTION: Do not cover the antenna façade with any object containing metal and/or electromagnetic wave absorption material such as: screwdrivers, pens, watches, floppy diskettes, CDs and metal wires, aluminum foil and metal-coated plastic bags, water or liquids, and/or carbon paper.**



Power Jack

The power jack enables you to connect the receiver to the charger and re-charge the Lithium-ion battery. The mini-S3 may be used while plugged into a power source and at the same time charge the battery.

CAUTION: Use only EMTAC branded chargers with the mini-S3 to charge the receiver.

WARNING: Use of other chargers can result in failure of the unit and/or its lithium-ion battery.

Charger

The charger connects the mini-S3 Receiver to a power source so the battery can be re-charged. The mini-USB plug of the charging cord connects to the mini-S3 via the power jack while the large end of the charger connects to the power source. The mini-S3 may be used while plugged into a power source while charging.

CAUTION: Use only EMTAC branded chargers with the mini-S3 to charge the receiver.

WARNING: Use of other chargers can result in failure of the unit and/or its lithium-ion battery.

Battery

The mini-S3 contains a removable, rechargeable Lithium-ion battery which supplies the power for the operation of the GPS and Bluetooth circuits inside the receiver. It is a low consumption battery with a minimum of 8 hours of continuous use after fully charged. The battery can be recharged using the EMTAC branded charger which came with the mini-S3. The mini-S3 may be used while the battery is being charged.

To remove the battery, slide the battery cover away from the device, then remove the battery.

CAUTION: Use only EMTAC branded chargers with the mini-S3 to charge the receiver.

WARNING: Use of other chargers can result in failure of the unit and/or its lithium-ion battery.

WARNING: Do not open the unit other than to replace the battery. There are no serviceable parts inside.

WARNING: Exposure to temperatures greater than 60°C (140°F) will damage the battery and poses a risk of explosion.

See WARNINGS on pages 22 - 23 for more extensive safety information on the battery.

Getting Started

Before using the mini-S3 BTGPS Receiver, the following tasks must be completed:

- **install a GPS/Mapping application software properly and completely on the host device.***
- **enable Bluetooth on the host device.***
- **fully charge the mini-S3 BTGPS receiver.**

* For information about the operation of the host device and GPS/Mapping application software installation procedures, please refer to the documentation that accompanies each product respectively.

1. Turn on the power of the mini-S3 & host device.

► Turn on the power of the host device and prepare for connection.

► Turn on the power of the BTGPS, the power switch is indicated as "B" in Figure 2. (Make sure the battery of the BTGPS is fully charged.)

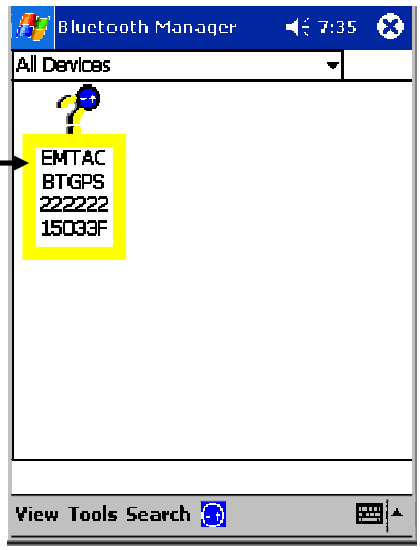
Once the mini-S3 is powered-on and before being paired/connected, the LED indicator lights should look like this:

LED Indicator	Symbol	Status Indication
BLUE		Flashing one time every second
GREEN		Constant on (i.e. no fixed position)
ORANGE/RED		No light (if fully charged)

2. Connect the mini-S3 with the host device.

Typical examples are given in the .pdf files named "BTpair_" (and/or similar files), in this User Guide CD-ROM. Please follow the step-by-step operation guide indicated and described in the files, respectively. If prompted, the mini-S3 BTGPS passkey is 0183.

Example:
This screen-shot indicates the BTGPS is connects with host.



3. Operating the GPS/Mapping software.

To open and use the GPS/MAP application, in your host device:

1. Make sure your BTGPS is connected with the host via Bluetooth.
2. Open the GPS/MAP application on the host device.
3. Enter the correct COM port and baud rate (4800-38400) into the GPS setup area of your GPS/MAP application.

You can use all the functions of GPS/MAP application software by following the detailed User Guide of the GPS/MAP application software.

Basic Use Guidelines

PROPER HANDLING

- Do not bend the mini-S3 BTGPS receiver while connected to the charger; bending will damage the connector, resulting in damage to the BTGPS and/or the charger's plug.
- The mini-S3 BTGPS has one power jack via the mini-USB connection. Caution and care must be exercised when handling these parts. Bending or breaking these parts will severely degrade positioning performance and/or damage the receiver. Bending or breaking these parts will void your warranty.
- Use only manufacturer approved accessories with the mini-S3 BTGPS. (See page 10.)
- There are no serviceable parts inside the miniS3 BTGPS receiver. DO NOT OPEN THE mini-S3 RECEIVER, OTHER THAN TO INSERT THE BATTERY. Only a qualified service professional may install or repair equipment. Opening the receiver will void the warranty.

RECEPTION OF SATELLITE SIGNALS

- A longer than normal time-to-first-fix of position may result the first time you use the mini-S3 BTGPS.
- Operating the GPS receiver requires a clear and unobstructed view of sky with the antenna facade pointing upward to the sky.
- GPS receivers may receive interference near cellular base-stations and when in close proximity to mobile phone antennas. This interference may affect positioning and time-to-fix performance.

SAFETY

- Read the "Warnings" section comprehensively before operation.
- Read the User Guide and these basic guidelines comprehensively. Breaching the regulations and rules may be dangerous or illegal.
- Road safety is the first priority; do not use or operate the mini-S3 BTGPS receiver while driving.
- The mini-S3 BTGPS is a radio emitting device. For your safety and the safety of others, discontinue operation of the mini-S3 receiver in areas with life support equipment, aircrafts, gasoline stations, near fuels or chemicals, near blasting areas, and in other areas restricting radio emitting devices.
- Keep the mini-S3 receiver away from high temperatures and fire. Additional detailed information is given in the "Warnings" section on page 20 of this User Guide.

Frequently Asked Questions

Which GPS/Map application software can I use?

There are a lot of major application software packages available. The mini-S3 will work with any mapping software that uses the industry standard NMEA messages. For laptops and Window Mobile devices, we recommend CoPilot Live from www.alk.com. For the Palm OS, we recommend the EMTAC Navigator Palm OS software.

Can I use the Crux-View for navigation purpose?

No. The Crux_View Test Program is only for evaluation and for testing purposes only; it is NOT designed for navigation.

What is the passkey or pin code for the mini-S3 paring with the PDA?

Please key-in: 0183. This the passkey or the pin code required.

I have already paired the mini-S3 BTGPS Receiver with the PDA, but sometimes it just cannot connect to the mini-S3.

Delete the 'old BTGPS icon' on your Bluetooth manager software, and re-search and pair it again.

It is possible to charge the battery and at the same time use the mini-S3?

Yes. This means you can have continuous use of the mini-S3 BTGPS Receiver.

The GPS program is not showing my location.

If the green light on the mini-S3 is flashing, check to see that you have the correct COM port and baud rate selected (4800-38400) and that your device is paired with the mini-S3. If the green light is not flashing, position the receiver so that it has an unobstructed view of the sky. If the green light is not flashing after being outside for more than fifteen minutes, please contact technical support.

The green light on my mini-S3 BTGPS will not come on.

Remove the unit from external power source. Turn unit on and let the batteries drain for 24-48 hours. After 24-48 hours, fully charge the mini-S3 and turn on. If green light is still off, please contact Technical Support for more information.

The blue light on my mini-S3 BTGPS will not come on.

Please contact Technical Support for more information.

Additional FAQ, technical support and new product information can be found at www.EMTAC.com.

Care and Maintenance

Your mini-S3 BTGPS receiver is a highly sophisticated piece of electrical equipment which requires special care and maintenance. Please follow the suggestions below to fulfill any warranty obligations and ensure you get the best performance possible from your mini-S3.

DO

Keep the mini-S3 BTGPS receiver dry.

Exposure to rain and/or environments with high humidity will cause the receiver to malfunction and create irreversible damage. Precipitation, humidity, and other liquids contain minerals that can corrode the electronic circuit boards as well as the connector, jack, and plug. Protective cases are available for the mini-S3. Please contact your retailer for more information.

Use/store the mini-S3 at a temperature between 15°C (59°F) & 25°C (77°F).

Exposure to extreme hot or cold conditions, such as a closed car in summer or winter, will affect the performance of the receiver and reduce both the capacity and lifetime of the battery.

When not in use, store the receiver in a clean environment.

If left in an unclean environment, dirt and dust can enter the circuit board and damage the receiver.

Clean with a soft, dry cloth.

Use of harsh cleaning solvents, chemicals or strong detergents will damage the receiver.

Use only EMTAC branded chargers to charge the mini-S3 receiver.

Use of any charger other than the one provided may damage the S3 and create the risk of explosion.

Use only accessories approved for use with the mini-S3.

Unauthorized accessories, antenna, modifications or attachments can damage the S3, may void warranty, and violate regulations governing radio devices.

Keep the mini-S3, battery, battery cover and all accessories out of small children's reach.

DON’T

Hit, drop, or shake the mini-S3.
Rough handling can break the internal electronic circuit boards, the connector, and/or the power jack resulting in irreversible damages and unit malfunction.

Store or expose to temperatures higher than 60°C (140°F).
High temperatures, such as in a car under direct sunlight, can shorten the life of electronic devices, and melt or drape certain plastics.

Store or expose to temperatures lower than 0°C (32°F).
Extreme temperatures affect the performance the battery. In addition, when the receiver warms up to its normal operation temperature, moisture can condense inside it, which may severely damage electronic circuit boards inside.

Attempt to open the mini-S3.
There are no serviceable parts inside the mini-S3. Unauthorized handling will void the warranty and may damage the receiver.

Paint the mini-S3.
Paint can clog the connector, jack, and prevent proper normal operation of the receiver.

How the mini-S3 BTGPS Works

The Global Positioning System (GPS) is a space-based radio-navigation system. This system consists of 24 satellites, which orbit the Earth at an altitude of approximately 17,500 kilometers. Each of the 24 satellites is deployed in 6 orbital planes and circles the earth twice a day. These systems of satellites continuously transmit signals containing precise information, 24 hours a day in any weather condition, everywhere around the world. By processing the signals received, the mini-S3 BTGPS receiver provides users with helpful information of position, velocity, and time for navigation and location based services anytime, anywhere on the Earth.

The time it takes the GPS to find the satellites is called the Time to First Fix (TTFF). The GPS receiver needs to lock on to at least 3 satellites for a position fix. The mini-S3 BTGPS Receiver acquires a position fix typically within 10 seconds from a hot-start state and roughly 80 seconds from a cold-start state. The initial state of the receiver, (i.e. the latest status in the memory of the receiver) primarily determines the time of TTFF. If you have not used your GPS unit for several months, the almanac data for the satellites may be out of date. The unit is capable of recollecting this information on its own, but the process can take as long as 3 to 5 minutes. The TTFF will also be longer the very first time the user first turns on the GPS receiver, when a GPS receiver has lost memory, or has been moved over 300 miles (500 km) from its last location will also be longer.

Both TTFF and positional accuracy can be affected by obstructions such as tall buildings, narrow streets & passageways, protective film on glass, heavy foliage, large cliffs, and other situations where GPS satellite signals are blocked.

Once there is a position fix, the mini-S3 uses the satellite signals to calculate an exact geodetic location through triangulation method, contained in 10 meters CEP accuracy devoid of Selective Availability (SA). The position data is then converted within the receiver to latitude and longitude coordinates, which is usually provided in the geodetic datum on which GPS is based (WGS 84). The map datum selected on a GPS receiver needs to match the datum listed on the corresponding paper map in order for the position readings to match. Using the wrong datum can result in position offsets of hundreds of meters or much more. In addition to using the wrong datum, accuracy can be limited by satellite orbiting errors, multi-path signals, atmospheric delay and receiver clock timing.

Transplant GPS, Inc. Limited Warranty

HARDWARE: Transplant GPS, Inc. warrants to the original end user (ie. Customer) that this product will be free from defects in workmanship and materials, for one year from the date of original purchase from Transplant GPS. The provisions of this warranty shall not apply if, in Transplant GPS's judgment, the product has been subject to misuse or neglect, improper installation, damaged in an accident, or repaired or altered in any way that adversely affects its performance and reliability. Transplant GPS's sole obligation under this express warranty shall be, at Transplant GPS's option, to replace the product or part with a comparable product or part, repair the product or part, or if neither repair nor replacement is reasonably available, Transplant GPS may, in its sole discretion, refund to Customer the purchase price paid for the product or part. Replacement products or parts may be new or reconditioned. Transplant GPS warrants any replaced or repaired product or part, and any hardware upgrade to which Customer is entitled under an agreement between Customer and Transplant GPS, for a period of ninety (90) days from shipment, or through the end of the original warranty, whichever is longer. All products or parts that are replaced become the property of Transplant GPS. This warranty does not cover products sold AS IS or WITH ALL FAULTS.

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GOVERNING LAW: This Limited Warranty shall be governed by the laws of the State of Minnesota, U.S.A. excluding its conflicts of laws principles and excluding the United Nations Convention on Contracts for the International Sale of Goods.

FCC Statement: This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. **Caution:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Changes or modifications made without written approval may void the user's authority to operate this equipment.

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Warnings

Care and Caution

The Global Positioning System (GPS) is operated by the United States Government which is solely responsible for the accuracy and continued operation of the system. Accuracy of position fixes (longitude, latitude and altitude) can be affected by alterations made to the GPS satellites by the U.S. Government. Accuracy is subject to change in accordance with the U.S. Department of Defense civil GPS user policy and Federal Radio Navigation Plan. Positional accuracy and time to fix time can also be affected by poor view of caused by obstructions such as tall buildings, heavy foliage, large cliffs and other obstructions where GPS satellite signals are blocked.

The mini-S3 BTGPS does not substitute the needs of careful steering and good judgment. Never rely on a single tool or apparatus for positioning and navigation.

Accessories

Use only an EMTAC branded charger with the mini-S3 BTGPS receiver. Use of other chargers can result in failure of the unit and /or its Lithium-ion battery.

Software

The software supplied in and with the mini-S3 BTGPS receiver is solely for personal use. Copies may be made only for personal use. The software may not be copied, modified, reverse engineered or transferred unless expressively provided by written agreement. The software is the property of Transplant GPS and/or its supplier and is protected by international treaty provisions.

Follow the operation guide as stated and described in the User Guide of the GPS application software.

Safety

The mini-S3 BTGPS contains Lithium-ion battery. For optimal battery capacity and life, keep the mini-S3 BTGPS between +15°C (+59°F) and +25°C (+77°F). Leaving the mini-S3 BTGPS in hot or cold conditions (e.g. a closed car in summer or winter conditions) will reduce the capacity and lifetime of the battery. The performance of Lithium-ion batteries is particularly limited in temperatures below 0°C (+32°F). A mini-S3 BTGPS with a hot or cold battery may temporarily not work, even when the battery is fully charged. Temperature extremes will also

affect the ability of your battery to charge. When operating in temperature extremes, allow the mini-S3 BTGPS to cool down or warm up prior to charging.

Charge the mini-S3 BTGPS only with the supplied charger. When a charger is not in use, disconnect it from the power source. Do not leave the mini-S3 BTGPS connected to a charger for longer than 24 hours; excessive charging may shorten its life. If left unused, a fully charged battery will discharge itself over time.

Batteries must be recycled or disposed of properly. Batteries must not be disposed of in municipal waste.

DO NOT DISPOSE OF THE mini-S3 BTGPS RECEIVER IN A FIRE!

CAUTION

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.

DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

To assure product safety, the battery maker requests following the statements be included in the instruction manual/User Guide of the equipment.

Danger

- When charging the battery, use dedicated chargers.
- Use the battery only in the specified equipment.
- Don't connect battery directly to an electrical outlet or cigarette lighter charger.
- Don't heat or throw battery into a fire.
- Don't use or leave battery close to fire or inside of a car where temperatures may be over 60°C. Also don't charge/discharge in such condition.
- Don't immerse, throw, or wet battery in/with water / seawater.
- Don't put batteries in your pockets or a bag together with metal objects such as necklaces, hairpins, coins, or screws. Don't store batteries with such objects.
- Don't short circuit the (+) and (-) terminals with other metals.
- Don't place battery in a device with the (+) and (-) in the wrong way around.
- Don't pierce battery with a sharp object such as a needle, etc.
- Don't hit with a hammer, step on, throw, or drop to cause strong shock.
- Don't disassemble or modify the battery.
- Don't solder a battery directly.
- Don't use a battery with serious scar or deformation.
- Don't use battery in a corrosive environment (damage from salt water, sea water, acid, alkali, corrosion gas, etc.).

Warning

- Don’t put battery into a microwave oven, dryer, or high-pressure container.
- Don’t use battery with dry cells and other primary batteries, or batteries of a different package, type, or brand.
- Stop charging the battery if charging isn’t completed within the specified time.
- Stop using the battery if abnormal heat, odor, discoloration, deformation, or abnormal conditions are detected during use, charge, or storage.
- Keep away from fire immediately when leakage or foul orders are detected.
- If liquid leaks onto your skin or cloths, wash well with fresh water immediately.
- If liquid leaking from the battery gets into your eyes, don’t rub your eyes, wash them well with clean water and go to see a doctor immediately.

Caution

- Store batteries out of reach of children so that they are not accidentally swallowed.
- Before using the battery, be sure to read the user’s manual and conditions on handling thoroughly.
- Thoroughly read the user’s manual for the charger before charging the battery.
- For information on installing and removing from equipment, thoroughly read user’s manual for the specific equipment.
- Batteries have life cycles. If the time that the battery powers equipment becomes much shorter than usual, the battery life is at an end. Replace the battery with a new battery of the same type.
- Remove a battery whose life cycle has expired from equipment immediately.
- When the battery is thrown away, be sure it is non-conduction by applying vinyl tape to the (+) and (-) terminals.
- When not using a battery for an expanded period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the battery is charged, used and stored, keep it away from objects or materials with static electric chargers.
- If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.

AC-DC Adapter

The power supply Certified

EINGANG/INPUT: 100-240VAC 50-60Hz 200mA

AUSGANG/OUTPUT: 5.0VDC 1000mA

Standard: EN60650

Battery

Lithium Ion Rechargeable Battery Pack

3.7V 700mAh Cell Type: LP053436A

Pack Model Name: NP40

Manufacturer: BYD Company Limited

Additional Battery Warnings

1. Do not put the battery into a fire, or heat the battery, do not store the battery in high temperature environment.
2. Do not connect the battery reversed in positive (+) and negative (-) terminals in the charger or equipment.
3. Do not let the battery terminals (+ and -) contact a wire or any metal (like a metal necklace or a hairpin) with which it carried or stored together, may cause short-circuit.
4. Do not drive a nail in, hit with a hammer, or stamp on the battery, do not strike the battery in other ways.
5. Do not disassemble or alter the batteries' outside structure.
6. Do not submerge the battery in water, do not wet the battery when store the battery.
1. Battery should be charged and discharged with proper charger, in compliance with correct operation contents.
2. Do not use the battery with other maker's batteries, different types and /or models of batteries such as dry batteries, nickel-metal hydride batteries, or nickel-cadmium batteries, or new and old lithium batteries together.
3. Do not leave the battery in a charger or equipment if it generates an older and/or heat, changes color and/or shape, leaks electrolyte, or cause any other abnormality.
4. Do not discharge the battery continuously when it is not charged.
1. In case young children use the battery, instruct them on the contents of the instructions and ensure the battery is correctly used by them at all times.
2. The battery was inspected carefully by QA before shipment to confirm with the specifications. However, in the case any abnormality of bad smell or heat, etc, arise after purchase, bring it and communicate with us.
3. For long-term storage, please charge at 0.5C for about one hour in advance.
4. Do not use the battery in other than the following conditions, otherwise, the battery might cause heat generation, damage, or deterioration of its performance.
Operating environment:
Charge : 0□ - +45□
Discharge : -20□ - +60□
Store less than 1 month : -20□ - +60□
Store less than 3 months : -20□ - +45□
Store less than 1 year : -20□ - +25□

Glossary

Almanac data

A set of information that transmitted by each GPS satellite in orbit and the state of every satellite in the GPS constellation. Each GPS satellite contains and transmits the almanac data set for the entire GPS satellite system network. Almanac data allows the GPS receiver to rapidly acquire satellites shortly after it is turned on.

Active Antenna

An antenna that amplifies the GPS signal before it sends it to the receiver.

Altitude

The distance between the current position and the nearest point on WGS 84 reference ellipsoid, usually it is expressed in meters or feet and is positive outside the ellipsoid.

Baud

Bits per second. Also referred to as a baud rate.

Channel

Channel refers to a set of hardware in the receiver that detects locks on and continuously tracks the signal from a single GPS satellite. The more channels available, the greater number of GPS satellite's signals a receiver can simultaneously lock and track. A receiver of 12 channels is the optimized design, considering the current consumption, chip-package size and cost.

CEP - Circular Error Probable

CEP is the radius of a circle, centered at a true location, within which fifty percent of positioning solutions fall. CEP is used to achieve horizontal accuracy.

C/N_o

Carrier-to-Noise density ratio. An indication of satellite signal strength received by the GPS receiver.

Cold Start

A condition in which the GPS receiver can arrive at a navigation solution without initial position, time, current Ephemeris, and almanac data.

Constellation

Constellation refers to the specific set of orbiting GPS satellites system, used in calculating positions or all the satellites visible to a GPS receiver at one time. The pattern created by the relative positioning of a GPS satellite network is designed to achieve a very high probability of global satellite coverage even in the event of satellite outages.

dB

Decibel. A notation of relative unit such as the satellite signal strength received.

Datum

A math model which depicts a part of the surface of the earth. Latitude and longitude lines on a paper map are referenced to a specific map datum. The map datum selected on a GPS receiver needs to match the datum listed on the corresponding paper map in order for the position readings to match.

Elevation mask

Elevation mask is an adjustable feature of GPS receivers that specifies a satellite must be a certain number of degrees above the horizon before its signals are used for positioning. Satellites at low elevation angles (five degrees or less) have lower signal strengths and are more prone to loss of lock thus causing noisy solutions.

Ellipsoid

A geometric surface which all of whose plane sections are either ellipses or circles.

Ephemeris

Ephemeris is a set of parameters used by a global navigation satellite receiver to predict the location of a satellite and its clock behavior. Each satellite contains and transmits ephemeris data about its own orbit and clock. Ephemeris data is more accurate than the almanac data but is applicable over a short time frame from four to six hours. Ephemeris data is transmitted by the satellite every 30 seconds. The predictions of current satellite position are transmitted to the user in the data message.

Geodetic coordinate

A coordinate system whose elements are latitude, longitude and geodetic height. The latitude is an angle based on the perpendicular to the ellipsoid. Longitude is the angle measured in the XY plane.

GIS (Geographic Information System)

A computer based system that is capable of collecting, managing and analyzing geographic spatial data. This capability includes storing and utilizing maps, displaying the results of data queries and conducting spatial analysis.

Hot Start

Start mode of the GPS receiver when current position, clock offset, approximate GPS time and current ephemeris data are all available.

L1 frequency

1575.42 MHz GPS carrier frequency which contains only encrypted P code, used primarily to calculate signal delays caused by the ionosphere.

Latitude

A north/south measurement of position perpendicular to the earth's polar axis.

Longitude

An east/west measurement of position in relation to the Prime Meridian, an imaginary circle that passes through the north and south poles.

Multipath

Multipath is the reception of a signal both along a direct path and along one or more reflected paths. Multipath signals result in an incorrect pseudorange measurement.

NMEA (NATIONAL MARINE ELECTRONICS ASSOCIATION)

A U.S. standards committee that defines data message structure, contents, and protocols to allow the GPS receiver to communicate with other pieces of electronic equipment aboard ships.

Selective Availability (SA)

Selective Availability is a process whereby the U.S. Department of Defense dithers the satellite clock and/or broadcasts erroneous orbital ephemeris data to create a pseudorange error to prevent adversaries from using the extremely accurate GPS positioning data.

Spread Spectrum

The received GPS signal is wide bandwidth and low power. The L-band signal is modulated with a pseudo random noise code to spread the signal energy over a much wider bandwidth than the signal information bandwidth. This provides the ability to receive all satellites unambiguously and to give some resistance to noise and multipath.

Time To First Fix (TTFF)

The time it takes to find the satellites is called the Time to First Fix (TTFF). If you have not used your GPS unit for several months, the almanac data for the satellites may be out of date. The unit is capable of recollecting this information on its own, but the process can take several minutes. The time it takes after the user first turns on the GPS receiver, when a GPS receiver has lost memory, or has been moved over 300 miles from its last location.

TRIANGULATION

A method of determining the location of an unknown point, as in GPS navigation, by using the laws of plane trigonometry.

Universal Time Coordinated (UTC)

UTC is the time as maintained by the U.S. Naval Observatory. Because of variations in the Earth's rotation, UTC is sometimes adjusted by an integer second. The accumulation of these adjustments compared to GPS time, which runs continuously, has resulted in an offset between GPS time and UTC. After accounting for leap seconds and using adjustments contained in the navigation message, GPS time can be related to UTC within 20 nanoseconds or better. Greenwich Mean Time (GMT) is still the standard time zone for the prime meridian (zero longitude).

Warm Start

Start mode of the GPS receiver when current position, clock offset and approximate GPA time are input by user or by the application software. Almanac is retained, but ephemeris data is clear.

Wide Area Augmentation System (WAAS)

Developed by the United States government, WAAS is a Satellite-Based Augmentation System (SBAS) that calculates the errors in the GPS signal at several monitoring stations around the country, then transmits error correction messages from geostationary satellites to GPS receivers.

World Geodetic System 1984 (WGS 84)

The primary map datum used by GPS. Secondary datums are computed as differences from the WGS 84 standard. WGS 84 is a set of U.S. Defense Mapping Agency (DMA) parameters for determining global geometric and physical geodetic relationships. Parameters include a geocentric reference ellipsoid; a coordinate system; and a gravity field model. GPS satellite orbital information in the navigation message is referenced to WGS 84.